PATENT ABSTRACTS OF JAPAN

(11)Publication number : 06-267304
(43)Date of publication of application : 22.09.1994

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(51)Int.Cl.
F21M 3/18
B60Q 1/14
F21M 3/05
F21M 3/14
H04N 7/18

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(21)Application number : 05-057031
(22)Date of filing : 17.03.1993
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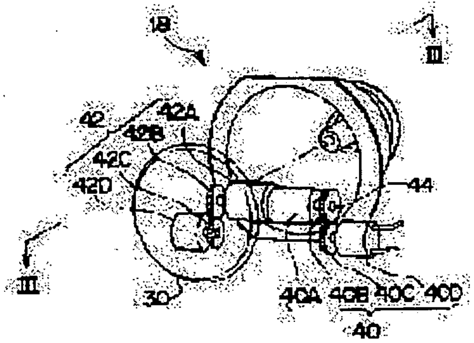
(54) HEAD LAMP DEVICE FOR VEHICLE

(57)Abstract:

PURPOSE: To improve the visibility in front of a vehicle without giving the glare to other vehicles.

CONSTITUTION: Cam-shaped shielding cams 40A, 42A continuously changed with the distance from a rotary shaft 44 to the outer periphery along the peripheral direction are provided in a head lamp 18. The shielding cams 40A, 42A are driven by motors 40D, 42D and individually rotated. The cut line on the right side in the vehicle width direction within cut lines appearing in front of a vehicle is vertically changed in position as the shielding cam 42A is rotated, and the cut line on the left side in the vehicle width direction is vertically changed in position as the shielding cam 42A is rotated. A control device not shown in the figure detects the position of another vehicle based on the image obtained when the front of the vehicle is picked up and controls the rotation of the shielding cam corresponding to the position of the other vehicle not to give the glare to the other vehicle.



LEGAL STATUS

[Date of request for examination] 06.04.1999

[Date of sending the examiner's decision of rejection]	20.08.2002
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	
[Date of registration]	
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

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CLAIMS

[Claim(s)]
[Claim 1] the object for vehicles characterized by providing the following -- a headlight -- equipment A change means to make the position of the boundary of the portion by which the light from a head lamp is irradiated in the field ahead of vehicles which are respectively different along the vehicles cross direction by preparing more than one in a head lamp, and changing the irradiation range or the direction of radiation of light respectively, and the portion which is not irradiated change A detection means to detect the position of the other car, and control means which control the change means corresponding to the position of the aforementioned other car not to give a glare to the aforementioned other car based on the position of the other car detected by the aforementioned detection means

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention -- the object for vehicles -- a headlight -- the vehicles which control the luminous intensity distribution of the head lamp which starts equipment and irradiates the front of vehicles during a vehicles run especially -- a headlight -- it is related with equipment
[0002]
[Description of the Prior Art] Couple arrangement of the head lamp is carried out at vehicles right-hand side and on the left-hand side of the vehicles front end section, when it is difficult to check a front situation by looking like night, the light is switched on, and the front visibility of a driver is raised. When this head lamp has the common composition which the irradiation range can change only to two stages of a high beam and a low beam and the other cars, such as precedence vehicles and opposite vehicles, exist, a low beam is chosen in many cases so that the unpleasant glare which makes the driver of the other car dazzle may not be given. however -- cases, like the distance between two cars with precedence vehicles is long, for example -- a low beam -- a driver -- irradiation of a head lamp -- continuing and viewing dark space out of range, by the high beam, always irradiating the suitable range of front had the problem of being difficult, like giving a glare to precedence vehicles etc.
[0003] For this reason, the gobo for shading irradiation light is prepared in the interior of a head lamp, without giving a glare to the other car, the aforementioned gobo is moved so that sufficient irradiation range may be acquired, and controlling the position of the boundary (this boundary is hereafter called cutline) of an irradiation field and a non-irradiated field is proposed. moreover, it considers as the technology which controls the position of a cutline so that a glare may not be given to the other car, the situation ahead of vehicles is picturized by the CCD camera etc., precedence vehicles are recognized based on the picture signal outputted from a CCD camera, the distance between two cars with precedence vehicles is detected, and controlling the luminous intensity distribution of a head lamp according to the distance between two cars is proposed (refer to Provisional-Publication-No. 62 No. -131837 official report)
[0004]
[Problem(s) to be Solved by the Invention] However, control of the position of the cutline by the gobo is performed to the whole cutline which continues along the vehicles cross direction. For this reason, since it was controlled to move to the position where precedence vehicles do not exist or a cutline does not give a glare to opposite vehicles in cases, like the distance between two cars with precedence vehicles is large when opposite vehicles approached, for example, shortage of the irradiation range arose without light fully being irradiated by the lane self-vehicles run, and there was a problem that the visibility of a driver fell.
[0005] the object for vehicles which can raise the visibility ahead of vehicles, without having accomplished this invention in consideration of the above-mentioned fact, and giving a glare to the other car -- a headlight -- it is the purpose to obtain equipment
[0006]

[Means for Solving the Problem] the object for vehicles which starts this invention in order to attain the above-mentioned purpose -- a headlight -- equipment By preparing more than one in a head lamp, and changing the irradiation range or the direction of radiation of light respectively A change means to make the position of the boundary of the portion by which the light from a head lamp is irradiated in the field ahead of respectively different vehicles along the vehicles cross direction, and the portion which is not irradiated change, It has the control means which control the change means corresponding to the position of the aforementioned other car so that a glare may not be given to the aforementioned other car based on the position of the other car detected by detection means to detect the position of the other car, and the aforementioned detection means.

[0007]

[Function] In this invention, two or more change meanses to make the position of the boundary of the portion by which the light from a head lamp is irradiated in the field ahead of respectively different vehicles along the vehicles cross direction, and the portion which is not irradiated change are prepared in the head lamp by changing the irradiation range or the direction of radiation of light respectively. By this, when the irradiation range or the direction of radiation of light is made to change by any one change means in two or more change meanses, the position of the boundary of the portion in the predetermined field corresponding to this change means by which light is irradiated, and the portion which is not irradiated, i.e., the position of a cutline, will be changed. Moreover, this invention detects the position of the other car and controls the change means corresponding to the position of the aforementioned other car based on the position of the detected other car not to give a glare to the aforementioned other car. Thus, since the change means corresponding to the position of the other car is controlled, when the other car is detected, it is controlled so that only the position of the cutline in the field where the detected other car exists does not give a glare.

[0008] For this reason, precedence vehicles do not exist or, also for example, in opposite vehicles having approached in the situation that the distance between two cars with precedence vehicles is large etc. While falling so that only the position of the cutline in the predetermined field where opposite vehicles exist may not give a glare to opposite vehicles, and giving a glare to the aforementioned opposite vehicles is prevented Since the position of the cutline of the portion which separated from the aforementioned field, for example, the cutline in the field corresponding to the lane self-vehicles run, does not fall, shortage of the irradiation range arises and the visibility of a driver does not fall. Thus, since it is controlled so that only the position of the cutline corresponding to the position of the other car does not give a glare when the other car is detected, the visibility ahead of vehicles can be raised, without giving a glare to the other car.

[0009]

[Example] Hereafter, with reference to a drawing, the example of this invention is explained in detail. as shown in drawing 1 , the engine hood 12 arranges in the upper surface section of front body 10A of vehicles 10 -- having -- **** -- the front end section of front body 10A -- the vehicles cross direction -- once -- since -- the other end is covered and the front bumper 16 is being fixed The head lamps 18 and 20 of a couple are arranged in vehicles cross direction both ends between this front bumper 16 and the first transition section of the engine hood 12.

[0010] Windshield glass 14 is formed near the back end section of the engine hood 12, and the room mirror 15 is formed in it near the part corresponding to the upper part side of the windshield glass 14 of the vehicles 10 interior. TV camera 22 for picturizing the situation ahead of vehicles near the room mirror 15 is arranged. TV camera 22 is connected to the image processing system 48 (refer to drawing 4). The TV camera which outputs the picture signal which is equipped with the CCD element which detects only the quantity of light as TV camera 22, and expresses monochrome picture with this example is used.

[0011] In addition, as for the arrangement position of TV camera 22, it is desirable to be arranged in the position near [as possible] the view position (the so-called eye point) of a driver so that the passage configuration ahead of vehicles can be recognized correctly and it may agree by visual feeling of a driver. Moreover, the passage configuration corresponding to one lane formed with a configuration, for example, the center line, a curbstone, etc. of an advance way is included in the passage configuration in this example.

[0012] Moreover, the speedometer which is not illustrated is arranged by vehicles 10 and the vehicle speed sensor 66 (refer to drawing 4) which detects the vehicle speed V of vehicles 10 is attached in the cable of this speedometer that is not illustrated. It connects with the image processing system 48, and this vehicle speed sensor 66 outputs the detection result of the vehicle speed V.

[0013] As shown in drawing 2 and drawing 3 , a head lamp 18 is a projector type head lamp, and is equipped with the convex lens 30, the bulb 32, and the lamp house 34. The lamp house 34 is being fixed to the frame which vehicles 10 do not illustrate by the abbreviation horizontal, and a convex lens 30 is fixed to one opening of a lamp house 34, and the bulb 32 is being fixed to opening of another side through the socket 36 so that the point emitting light may be located on the optical axis L of a convex lens 30 (medial axis of a convex lens 30).

[0014] The reflector 38 of an ellipse reflector is formed in the bulb side of the lamp house 34 interior, it is reflected by the reflector 38 and the light injected from the bulb 38 is condensed between a convex lens 30 and a bulb 32. Actuators 40 and 42 are arranged in this condensing neighborhood of a point. The actuator 40 equips the axis of rotation 44 fixed so that it might meet crosswise [vehicles] in a lamp house 34 with shading cam 40A supported to revolve possible [rotation], and gearing 40B has fixed to this shading cam 40A. In gearing 40B, gearing 40C which fixed to the driving shaft of motor 40D has geared. Motor 40D is connected to the driver 64 of a control unit 50.

[0015] moreover, it comes out with shading cam 42A supported to revolve by the aforementioned axis of rotation 44 possible [rotation], gearing 40B which fixed to shading cam 40A, motor 42D, and gearing 40C which fixes to a driving shaft at motor 42D, and gears with gearing 40B, and the actuator 42 as well as an actuator 40 is constituted Motor 40D is also connected to the driver 64 of a control unit 50. The light of the bulb 32 by which reflective condensing was carried out by the reflector 38 is shaded by the shading cams 40A and 42A of actuators 40 and 42, and the other light is injected from a convex lens 30.

[0016] The distance from the axis of rotation 44 to a periphery is carrying out the cam configuration which changes continuously along with a circumferencial direction, and the aforementioned shading cams 40A and 42A rotate it separately respectively, when Motors 40D and 42D drive according to the signal from a control unit 50. The position of the boundary where the light of a bulb 32 is divided by passage light and the shaded light changes up and down with rotation of these shading cams 40A and 42A. It will appear as a cutline this boundary of whose is a boundary of the light and darkness in the luminous intensity distribution ahead of vehicles 10.

[0017] As shown in drawing 7 , the aforementioned boundary formed of shading cam 40A When it appears as a cutline 70 on the right-hand side of [in the irradiation field by the head lamp 18] the vehicles cross direction and shading cam 40A rotates, the position of a cutline 70 It moves to parallel from the position (the position shown in drawing 7 as a solid line as a cutline 70, position below the so-called high beam) corresponding to the most significant to the position (the position shown in drawing 7 with a fictitious outline, position of the so-called low beam average) corresponding to the least significant.

[0018] Moreover, the aforementioned boundary formed of shading cam 42A appears as a cutline 72 on the left-hand side of [in an irradiation field] the vehicles cross direction, and when shading cam 42A rotates, the position of a cutline 72 moves to parallel from the position (the position shown in drawing 7 as a solid line as a cutline 72, position below the so-called high beam) of the most significant to the position (the position shown in drawing 7 with a fictitious outline, position of the so-called low-beam average) of the least significant.

[0019] Moreover, since a head lamp 20 is the same composition as a head lamp 18, although detailed explanation is omitted, as shown in drawing 4 , actuators 41 and 43 are attached, and the position of the cutline on the left-hand side of an irradiation field and the position of a right-hand side cutline are respectively moved separately with the operation of actuators 41 and 43.

[0020] As shown in drawing 4 , the control unit 50 is constituted including the buses 62 which connect a read-only memory (ROM) 52, RAM (RAM) 54, a central processing unit (CPU) 56, input port 58, an output port 60, and these, such as a data bus and a control bus. In addition, the map and control program which are mentioned later are memorized by this ROM52.

[0021] The vehicle speed sensor 66 and the image processing system 48 are connected to input port 58. This image processing system 48 carries out the image processing of the image picturized by TV camera 22 based on the signal inputted from TV camera 22 and a control unit 50 so that it may mention later. The output port 60 is connected to the actuators 40 and 42 of a head lamp 18, and the actuators 41 and 43 of a head lamp 20 through the driver 64. Moreover, the output port 60 is connected also to the image processing system 48.

[0022] Next, an operation of this example is explained with reference to the flow chart of drawing 5 and drawing 6 . If a driver turns on the light switch which vehicles 10 do not illustrate and head lamps 18 and 20 are made to turn on, the control main routine shown in drawing 5 for every predetermined time will be performed. At Step 200 of this control main routine, other car recognition processing is performed and the opposite vehicles which are running the precedence vehicles precede with self-vehicles and it is running, and the lane which counters are recognized. This other car recognition processing is explained with reference to the flow chart of drawing 6 .

[0023] When vehicles 10 are running the road 122, an example (image 120) of the image which carried out abbreviation coincidence with the picture checked by looking by the driver picturized by TV camera 22 is shown in drawing 8 (A). This road 122 equips with the white line 124 the both sides of the lane vehicles 10 run. In addition, a position is pinpointed by the coordinate (Xn and Yn) of the system of coordinates which become settled by the X-axis by which each pixel on the above-mentioned image was set up on the image, and which intersects perpendicularly respectively, and the Y-axis. Below, recognition of the other car is performed based on this image.

[0024] At Step 400, the field which has the predetermined width of face gamma on an image as shown in drawing 9 is set up as a white line detection window field Wsd. In this example, the white line of the position which crosses 60m of front of vehicles 10 in consideration of only the picture to the abbreviation 40-50m ahead of vehicles 10 being undetectable at the time of a night run of vehicles 10 is not detected. Moreover, the field of the lower part in a picture has the low accuracy in which the other car exists. For this reason, the white line detection window field Wsd which removed the downward field from a 140 or more-horizontal line predetermined field and the predetermined minimum line 130 is set up so that the white line detection window field Wsd can be detected even for 60m even of front of vehicles 10.

[0025] At the following step 402, the inside of the window field Wsd is differentiated about brightness, and the peak point (the maximum point) of this differential value is extracted as an edge point which is a white line candidate point. That is, the inside of the window field Wsd is differentiated [pixel / each / horizontal perpendicularly (the direction of drawing 9 arrow A)] about the brightness from the pixel of the lowest position to the pixel of the best position, and change of a luminosity extracts the peak point of a big differential value as an edge point. The edge point which continues by this like the dashed line 132 shown in the window field Wsd of drawing 9 as an example is extracted.

[0026] Straight-line approximation processing is performed at Step 404. This processing carries out straight-line approximation of the edge point extracted by white line candidate point sampling processing using the Hough (Hough) conversion, and asks for the approximation straight lines 142 and 144 which met the line presumed to be a white line. intersection PN which asked for and asked for the intersection PN of the approximation straight line for which it asked (X coordinate value =XN) at the following step 405 a horizontal variation rate with the intersection P0 (X coordinate value =X0) of the approximation straight line in the case of the straight-line way which is made into criteria and which was appointed beforehand -- an amount A (A=XN-X0) is calculated This amount A of displacement corresponds to the degree of the curve of a road 122.

[0027] At the following step 406, the amount A of displacement is A2 >=A>=A1. A road 122 judges whether it is an abbreviation straight-line way by judging whether it is within the limits. This criterion value A1 It is a reference value showing the boundary of a straight-line way and a right curve way, and is the criterion value A2. It is a reference value showing the boundary of a straight-line way and a left curve way. When judged with a straight-line way at Step 406, the vehicle speed V of the self-vehicles 10 is read at Step 408.

[0028] Vehicles recognition field WP which recognizes precedence vehicles and opposite vehicles at the following step 410 according to the read vehicle speed V It is in charge of setting up and they are amendment amendment width-of-face alphaL and alphaR about the position of an approximation straight line. It determines. At the time of a high-speed run, even if the direct front of vehicles is a road near an abbreviation straight line since the radius of curvature which can circle is small at the time of a low-speed run, although it can consider that it is running the road of an abbreviation straight line, since the radius of curvature of the road in which vehicles can circle is large, when the radius of curvature of a road is small at the distant place, vehicles are the vehicles recognition fields WP. Shell deviation may be carried out. For this reason, aforementioned amendment width-of-face alphaL and alphaR Using a map as shown in drawing 12 , it is determined that a value becomes large as speed V becomes low.

[0029] the following step 412 -- a minimum line 130, amendment width-of-face alphaL, and alphaR the field (field presumed that opposite vehicles exist) of three square shapes predetermined to the right-hand side of the field (field presumed that precedence vehicles exist) surrounded in the approximation straight lines 142 and 144 by which the position was amended -- in addition, the vehicles recognition field WP for carrying out recognition processing of precedence vehicles and the opposite vehicles It determines (refer to drawing 10). In addition, this vehicles recognition field WP Aforementioned amendment width-of-face alphaL according to change of the vehicle speed V and alphaR even if it attaches With change, area is enlarged as the time of a low-speed run comes (refer to drawing 11). In addition, although left-hand traffic is assumed in this example, the field of the triangle which will be presumed that opposite vehicles exist if it is right-hand traffic is added to the left-hand side of the field presumed that the aforementioned precedence vehicles exist.

[0030] if the judgment of Step 406 is denied on the other hand -- Step 414 -- setting -- A>A2 ****** -- by judging, a road judges a right curve way or a left curve way They are amendment width-of-face alphaL according to the vehicle speed V which the road was judged to be a right curve way, read the vehicle speed V of vehicles 10 at Step 416, and was read using the map shown in drawing 12 when a judgment was affirmed, and alphaR. Receiving correction value alphaL' and alphaR' are determined at Step 418. the variation rate which expresses the degree of a curve with the following step 420 -- an amount A -- responding -- amendment width-of-face alphaR of an approximation straight line on either side, and alphaL correction value alphaR' which determined the gain GL and GR for determining using the map shown in drawing 13 and drawing 14 , and was determined at Step 422, and alphaL -- ' and the gain GL and GR -- being based -- final amendment width-of-face alphaR of right and left of a window field, and alphaL It determines.

[0031] At this time, since a road is a curve way, it becomes unsymmetrical [right and left], and the approximation straight lines 142 and 144 serve as a different inclination. For this reason, amendment width-of-face alphaR on either side and alphaL It is set as the independent value. That is, the accuracy to which the precedence vehicles 11 exist [a road] in right-hand side when radius of curvature is small (the amount [Variation rate] A size) is high on a right curve way. Therefore, it is amendment width-of-face alphaR by enlarging right-hand side gain GR. It is amendment width-of-face alphaL by enlarging (referring to drawing 13) and making left-hand side gain GL small. It is made small (refer to drawing 14). Moreover, when radius of curvature is large (the amount [Variation rate] A smallness) and a road makes right-hand side gain GR small on a right curve way, it is amendment width-of-face alphaR. It is amendment width-of-face alphaL by making it small and enlarging left-hand side gain GL. It enlarges. Change of this amendment width of face is shown in drawing 15 as an image.

[0032] Amendment width-of-face alphaL determined at Step 424, and alphaR Vehicles recognition field WP for adding the field of three predetermined square shapes presumed that opposite vehicles exist in the right-hand side of the field surrounded in the approximation straight lines 142 and 144 by which the position was amended like the above, and carrying out recognition processing of precedence vehicles and the opposite vehicles It determines.

[0033] On the other hand, when the judgment of Step 414 is affirmed, it judges that a road is a left curve way, and shifts to Step 426, and the vehicle speed V of vehicles 10 is read. At Step 428, it responds to the vehicle speed V read using the map of drawing 12 , and they are correction value alphaR' on either side and alphaL'. It determines and the gain GL and GR of the right and left according to the amount A of displacement is determined at Step 430. That is, when radius of curvature is small (the amount [Variation rate] A size) and a road makes right-hand side gain GR small on the map shown in drawing 16 on a left curve way since the accuracy to which the precedence vehicles 11 exist in left-hand side is high, it is amendment width-of-face alphaR. It is amendment width-of-face alphaL by enlarging left-hand side gain GL on the map which makes small and is shown in drawing 17 . It enlarges.
[0034] Correction value alphaR' determined at the following step 432, and alphaL' And gain GL, It is based on GR and they are final amendment width-of-face alphaR of right and left of a window field, and alphaL. It determines. Amendment width-of-face alphaR of the right and left determined at Step 434, and alphaL On the right-hand side of the field surrounded in the approximation straight lines 142 and 144 by which the position was amended Vehicles recognition field WP for adding the field of three predetermined square shapes presumed that opposite vehicles exist, and carrying out recognition processing of precedence vehicles and the opposite vehicles It determines.
[0035] It is the vehicles recognition field WP as mentioned above. If determined, it will shift to Step 436, and it is the vehicles recognition field WP as recognition processing of the other car. Inner level edge-detection processing is performed. This level edge-detection processing is the vehicles recognition field WP about detecting a level edge point like edge-detection processing of Step 402 first. It carries out inside. Next, peak point EP of a position that integrate with the detected level edge point in a longitudinal direction, and an integration value exceeds a predetermined value It detects (refer to drawing 8 (B)). This level edge has high possibility of appearing when the other car exists.
[0036] The position coordinate of the other car is calculated at the following step 438. Perpendicular edge-detection processing is performed first. peak point EP of the integration value of a level edge point Peak point EP of being located below on a picture when there are more than one from -- order -- peak point EP The window field WR for detecting a vertical line so that the ends of the level edge point included may be included respectively, and WL It sets up (refer to drawing 8 (C)). This window field WR and WL When the perpendicular edge was detected inside, and vertical lines 138R and 138L are stabilized and are detected, they are the window field WR and WL. It judges with the other car existing in the field across which it faced.
[0037] Next, the window field WR and WL By asking for the interval of the longitudinal direction of the vertical lines 138R and 138L detected in inner each, it asks for breadth of a car, and the coordinate of the center of breadth of a car is searched for as a coordinate (Xi, Yi) of the center of vehicles. It is the vehicles recognition field WP about this processing. By repeating inside, as shown also in drawing 18 as an example, it is the vehicles recognition field WP. The position coordinate of n vehicles (drawing five sets) which exist inside is searched for. In addition, since the detected vertical lines 138R and 138L correspond to the crosswise both ends of the tail section of vehicles, the coordinate (Xi, Yi) expresses the position near the center section of the tail section of the other car. Other car recognition processing is ended by the above, and it shifts to Step 202 of the flow chart of drawing 5 .
[0038] At Step 202, initial setting of the coordinate value (XL, YL) of the vehicles with which the value of a Y coordinate exists in the smallest position in the coordinate value (XR, YR) of the vehicles with which the value of a Y coordinate exists in the smallest position in the right-hand side of the irradiation field used by the gain setting processing mentioned later, and the right-hand side of an irradiation field is performed. Here, the value corresponding to the position of the cutline 70 at the time of a high beam is set as YR, the value corresponding to the position of the cutline 72 at the time of a high beam is set as YL, and any value is set to XR and XL. At Step 204, the value of the area "i" prepared on memory is set to 1, and Step 206 performs incorporation of the coordinate (Xi, Yi) of the vehicles of eye the "i" base among the position coordinates of n vehicles determined by the above-mentioned other car recognition processing.
[0039] At Step 208, the direction position of X of the i-th vehicles judges whether it is located in the

right-hand side in the irradiation field of head lamps 18 and 20, it is located in left-hand side, or it is located in the center based on the value of incorporated Xi. In addition, the right-hand side in an irradiation field here is a field corresponding to the cutline 70 shown in drawing 7 , and the left-hand side of an irradiation field is a field corresponding to a cutline 72. Moreover, when the direction position of X of vehicles is a position concerning a cutline 70 and a cutline 72, it is judged that it is located in the center.

[0040] When vehicles are judged to be located in left-hand side at Step 208, it shifts to Step 210, and it judges whether the value of Yi is smaller than the value of a coordinate value YL. Yi is substituted for YL, Xi is respectively substituted [in / Step 212 / when the judgment of Step 208 is affirmed] for XL, and it shifts to Step 226. On the other hand, when vehicles are judged to be located in right-hand side at Step 208, it shifts to Step 222, and it judges whether the value of Yi is smaller than the value of a coordinate value YR. If this judgment is affirmed, Yi will be substituted for YR, Xi will be respectively substituted for Step 224 at XR, and it will shift to Step 226.

[0041] moreover, when it is judged that it is located in the center of the irradiation field which requires vehicles for cutlines 70 and 72 at Step 208 When it judges whether the value of Yi is smaller than the value of YL at Step 214 and a judgment is affirmed, while substituting Yi for YL and substituting Xi for Step 216 respectively at XL When it judges whether the value of Yi is smaller than the value of YR at the following step 218 and a judgment is affirmed, Yi is substituted for YR, Xi is respectively substituted for Step 216 at XR, and it shifts to Step 226.

[0042] At Step 226, it is recognized by other car recognition processing, and judges whether the above-mentioned processing was performed to all the other cars with which the position was detected. When the judgment of Step 226 is denied, "1" is added to i at Step 228, it returns to Step 206, and processing of Steps 208-226 is repeated based on the coordinate which incorporated and incorporated the coordinate (Xi, Yi) of the following vehicles. Therefore, when n vehicles have been recognized in other car recognition processing of Step 200, after processing of Steps 206-228 is repeated n times, the judgment of Step 226 is affirmed and it shifts to Step 230.

[0043] When the judgment of this step 226 is affirmed, the coordinate of the vehicles with which the value of a Y coordinate exists in the smallest position in the right-hand side (and center) of the irradiation field of a head lamp will be stored in a coordinate value (XR, YR), and the coordinate of the vehicles with which the value of a Y coordinate exists in the smallest position in the left-hand side (and center) of the irradiation field of a head lamp will be stored in a coordinate value (XL, YL). The vehicles which exist in this (XR, YR) position of (XL, YL) are vehicles which are the easiest to give a glare in the right-hand side and left-hand side of an irradiation field. In addition, when vehicles do not exist, or when vehicles exist in the position (namely, very much distant place) higher than the cutline position at the time of the high beam of a head lamp, a coordinate value (XR, YR) and (XL, YL) the value at the time of initial setting are held.

[0044] As processing which defines the gain set as actuators 40, 41, 42, and 43, based on a coordinate value (XR, YR), the gain DEGR of the rotation angle of shading cam 40A is set that the position of a cutline 70 is in agreement with YR, and the gain DEGL of the rotation angle of shading cam 42A is set that the position of a cutline 72 is in agreement with YL at Step 230 based on a coordinate value (XL, YL). The determination of this gain DEGR and DEGL can be defined with reference to the map showing the relation of YR and DEGR which were defined beforehand, for example, and the map showing the relation between YL and DEGL.

[0045] At the following step 232, based on the gain DEGR and DEGL determined above, the motors 40D and 42D of actuators 40 and 42 are driven, and the shading cams 40A and 42A are rotated. In addition, about an actuator 41, it drives [actuator / 43 / as well as an actuator 40] respectively like an actuator 42. Thereby, it is controlled so that the position of the position of a cutline 72 of a cutline 70 corresponds with YL in accordance with YR. As mentioned above, the coordinate of the other car detected by other car recognition processing expresses the position of the center section of the tail section of the other car, and since it is located near the center of the tail section of vehicles a cutline tends to give a glare by this control, a glare is not given to the other car. However, when the position of

YR and YL is lower than the minimum position of a cutline, a cutline is reduced to the aforementioned minimum position.

[0046] Next, the control result of the cutline by the above-mentioned processing is explained. For example, when vehicles exist only in the position (left-hand side of the vehicles 10 front) of the point which gave the sign of "1" to drawing 18 as the other car of the vehicles 10 front, the position of a cutline 72 is controlled in agreement with the position of the point of "1", as an alternate long and short dash line shows to drawing 19 . At this time, although the cutline 70 on the right-hand side of the irradiation range is in the upper limit position shown as a solid line, a glare is not given to the aforementioned vehicles and the driver of vehicles 10 does not feel shortage of the irradiation range.

[0047] Moreover, since the coordinate Y2 of this point is lower than the minimum position of a cutline 72 when vehicles exist also in the position of the point which gave the sign of "2", for example to drawing 18 , the position of a cutline 72 falls to drawing 19 to the minimum position shown with a two-dot chain line. Also at this time, as for a cutline 70, it is maintained in an upper limit position. Moreover, when vehicles exist only in the point of "5" of drawing 18 (right-hand side ahead of vehicles), the position of a cutline 70 is controlled in agreement with the position of the point of "5", as a solid line shows to drawing 20 . At this time, the position of a cutline 72 is maintained in an upper limit position.

[0048] Furthermore, when vehicles exist only in the point of "4" of drawing 18 (center ahead of vehicles), the position of a cutline 70 and a cutline 72 is controlled respectively in agreement with the position of the point of "4", as a two-dot chain line shows to drawing 21 . It is prevented that this gives a glare to the vehicles located in the point of "4." Moreover, since the coordinate Y3 of this point is lower than the minimum position of a cutline 70 and a cutline 72 when vehicles exist in the point of "3" of drawing 18 (similarly center ahead of vehicles), the position of a cutline 70 and a cutline 72 falls to drawing 21 to the minimum position shown with an alternate long and short dash line.

[0049] Thus, since only the position of the cutline in the field where the detected other car exists is controlled when the shading cams 40A and 42A divide the cutline of a head lamp into a cutline 70 and a cutline 72, it constitutes so that each position can be controlled by actuators 40 and 42, and the other car is detected, while giving a glare to the detected other car is prevented, a driver does not feel shortage of the irradiation range.

[0050] Moreover, since the luminous intensity distribution of a head lamp are controlled by this example according to the position of the other car in a picture, detection of the distance between two cars can become unnecessary, and can process an operation etc. in a short time. moreover, in controlling the luminous intensity distribution of a head lamp according to the distance between two cars Although a glare may be given and the amendment need produces the irradiation range (or direction of radiation) according to the aforementioned inclination, an inclination, etc. when the relative position and relative direction of the other car change with the inclination of a road, the inclinations of vehicles, etc., even if the distance between two cars with the other car was fixed Since the sense of TV camera 22 and head lamps 18 and 20 changes according to this even if there are inclination of a road, an inclination of vehicles, etc. in this example Since the picture according to the aforementioned inclination or the inclination is acquired and the luminous intensity distribution of a head lamp are controlled according to the position of the other car in this picture, it is not necessary to perform the aforementioned amendment etc.

[0051] In addition, although the luminous intensity distribution ahead of vehicles were controlled by the shading cam, you may make it shade the light of a head lamp by the gobo or the shutter in the above-mentioned example. Moreover, although luminous intensity distribution are controlled by shading the light of a head lamp, you may make it deflect the injection optical axis of a head lamp.

[0052] Moreover, although a cutline is divided into a cutline 70 and a cutline 72 from a center and it was made to control the position of each cutline by this example by the shading cams 40A and 42A, the number of partitions and the division position of a cutline are not limited to this.

[0053]

[Effect of the Invention] As explained above, in this invention, by changing the irradiation range or the direction of radiation of light respectively Two or more change meanses to make the position of the boundary of the portion by which the light from a head lamp is irradiated in the field ahead of respectively different vehicles along the vehicles cross direction, and the portion which is not irradiated change are prepared in a head lamp. Since the change means corresponding to the position of the other car was controlled based on the position of the detected other car not to give a glare to the other car when the other car was detected The outstanding effect that the visibility ahead of vehicles can be raised is acquired without giving a glare to the other car.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective diagram seen from the vehicles slanting front which shows the vehicles anterior part used for this example.
[Drawing 2] It is the perspective diagram showing the outline composition of the head lamp which can apply this invention.
[Drawing 3] III-III of drawing 2 It is the cross section which met the line.
[Drawing 4] It is the block diagram showing the outline composition of a control unit.
[Drawing 5] It is a flow chart explaining the control main routine of this example.
[Drawing 6] It is a flow chart explaining other car recognition processing.
[Drawing 7] It is an image view for explaining the cutline displaced with an actuator.
[Drawing 8] The conceptual diagram for the image view of a picture where (A) is picturized by the TV camera at daytime, and (B) explaining level edge point integration processing, and (C) are the conceptual diagrams for explaining perpendicular edge-detection processing.
[Drawing 9] It is the diagram showing the window field at the time of white line recognition.
[Drawing 10] It is the diagram showing a vehicles recognition field.
[Drawing 11] It is an image view for explaining fluctuating a vehicles recognition field according to the vehicle speed.
[Drawing 12] It is the diagram showing the relation between the vehicle speed and the amendment width of face of an approximation straight line.
[Drawing 13] It is the diagram showing a relation with the gain which determines the amendment width of face of the approximation straight line of the degree of a right curve way, and right-hand side.
[Drawing 14] It is the diagram showing a relation with the gain which determines the amendment width of face of the approximation straight line of the degree of a right curve way, and left-hand side.
[Drawing 15] It is the image view showing the window field and amendment width of face to a curve way of different curvature.
[Drawing 16] It is the diagram showing a relation with the gain which determines the amendment width of face of the approximation straight line of the degree of a left curve way, and right-hand side.
[Drawing 17] It is the diagram showing a relation with the gain which determines the amendment width of face of the approximation straight line of the degree of a left curve way, and left-hand side.
[Drawing 18] It is the image view showing an example showing the position of the other car detected by other car recognition processing of a coordinate.
[Drawing 19] It is the image view showing the control result of the position of a cutline when vehicles exist in "1" of drawing 18 , or the position of "2."
[Drawing 20] It is the image view showing the control result of the position of a cutline when vehicles exist in the position of "5" of drawing 18 .
[Drawing 21] It is the image view showing the control result of the position of a cutline when vehicles exist in "3" of drawing 18 , or the position of "4."
[Description of Notations]

18 Head Lamp
20 Head Lamp
22 TV Camera
40 Actuator
42 Actuator
48 Image Processing System
50 Control Unit
70 Cutline
72 Cutline
100 Run Vehicles Detection Equipment

[Translation done.]

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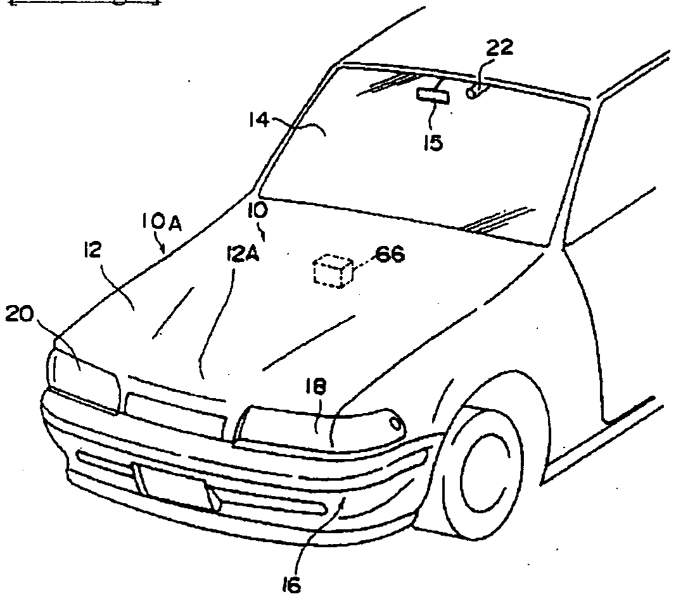
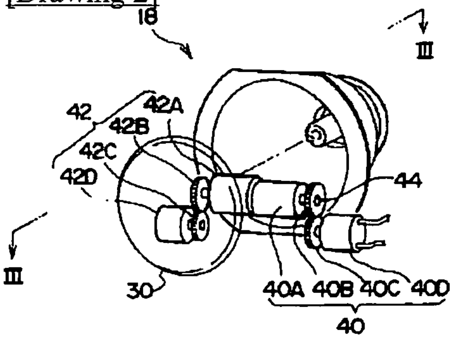
3.In the drawings, any words are not translated.

DRAWINGS

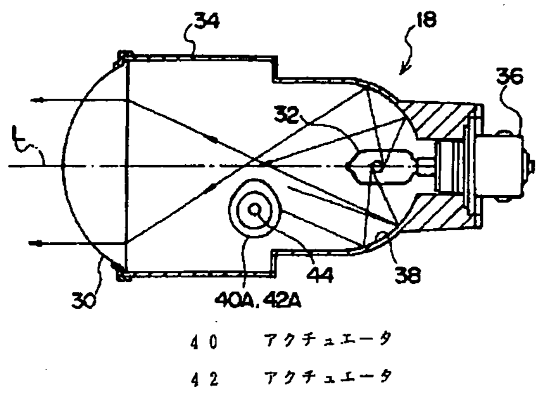
[Drawing 1]


22
14
15
10A
10
12
12A
66
20
18
16

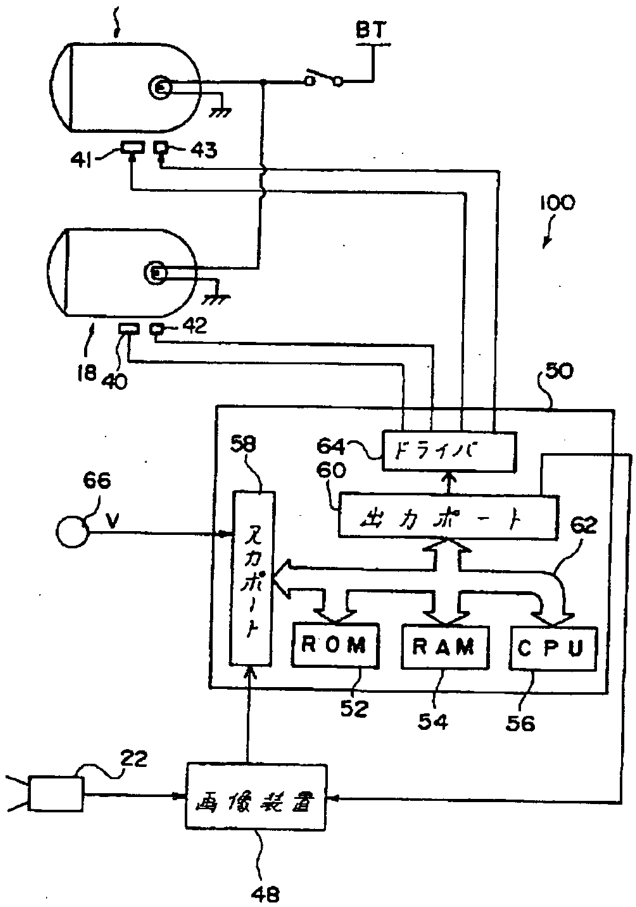
[Drawing 2]


18
III
42
42A
42B
42C
42D
44
III
30
40A
40B
40C
40D
40

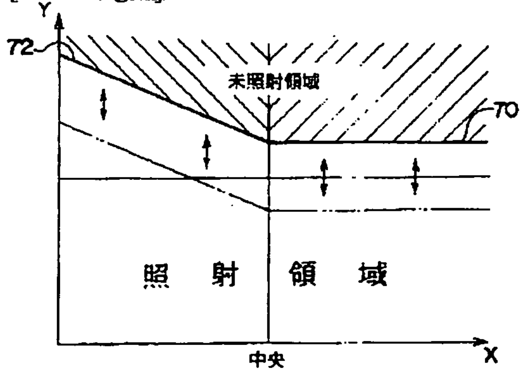
[Drawing 3]


34
18
36
32
L
30
40A.42A
44
38
40　アクチュエータ
42　アクチュエータ

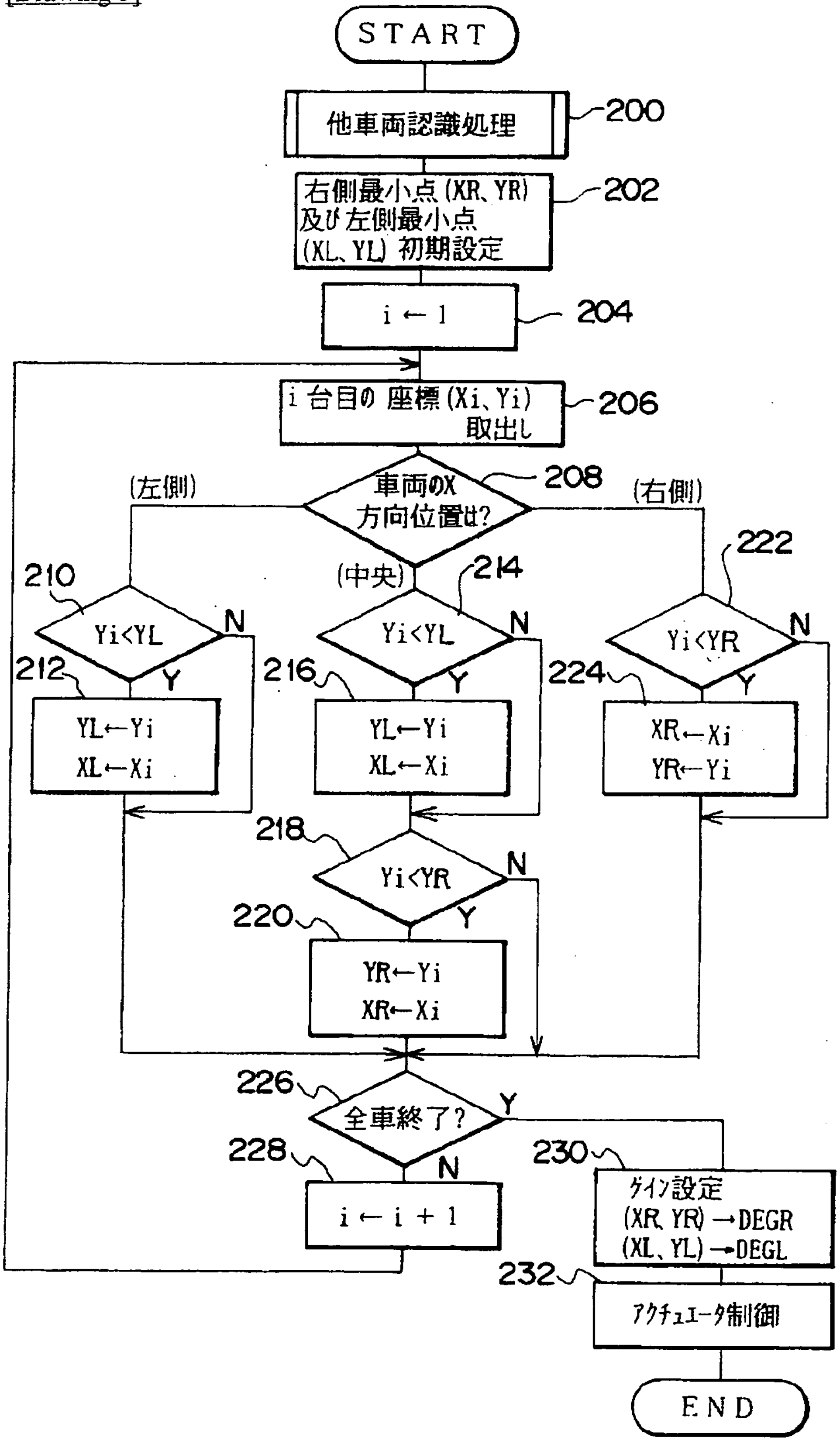
[Drawing 4]


20
BT
41
43
100
18
40
42
50
64
ドライバ
60
出力ポート
62
58
入力ポート
66
V
ROM
RAM
CPU
52
54
56
22
画像装置
48

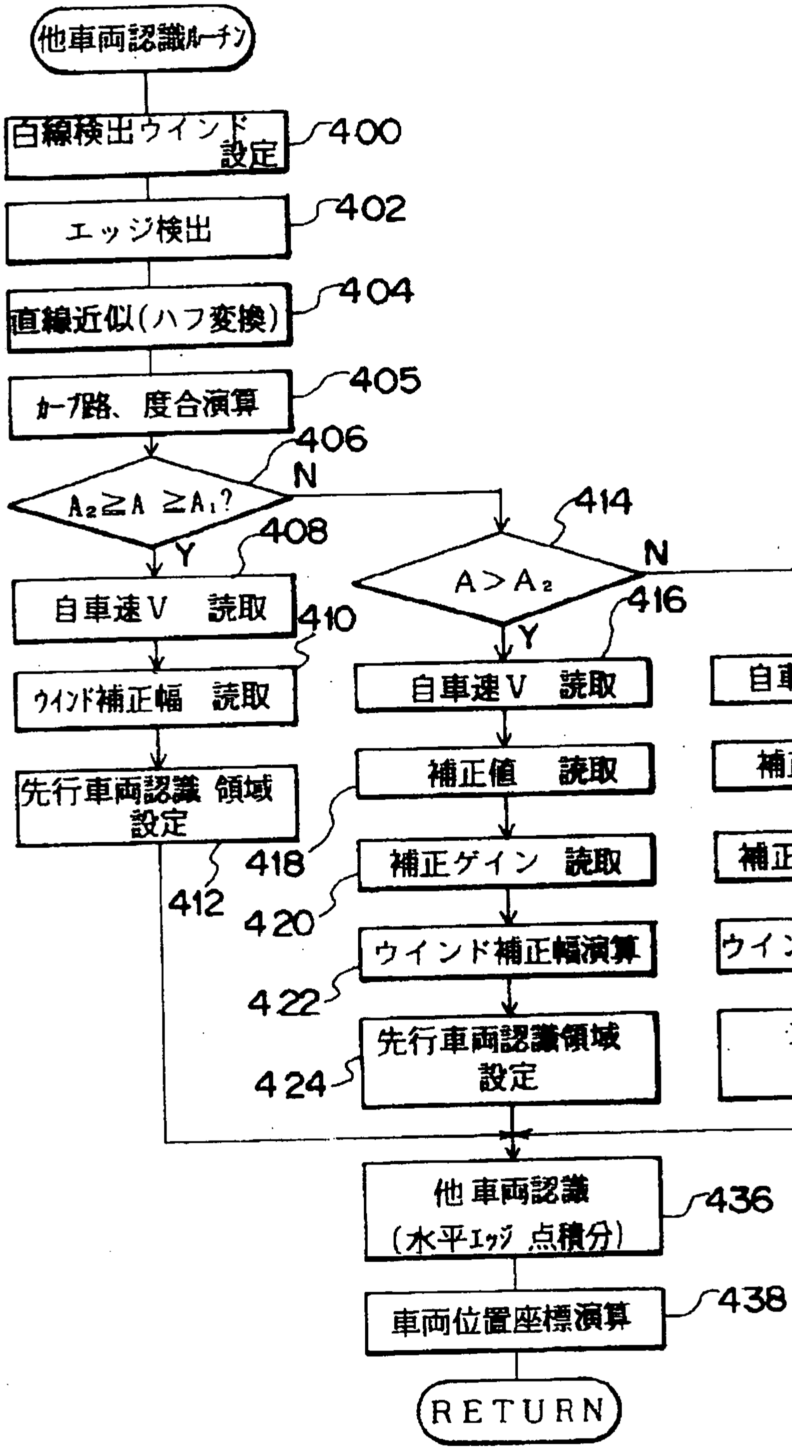
[Drawing 7]


Y
72
未照射領域
70
照射領域
中央
X

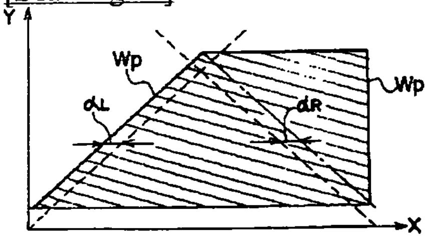
[Drawing 5]


START
他車両認識処理
200
右側最小点(XR、YR)及び左側最小点(XL、YL)初期設定
202
i ← 1
204
i台目の座標(Xi、Yi)取出し
206
車両のX方向位置は?
208
(左側)
(右側)
(中央)
210
Yi<YL
N
Y
212
YL←Yi
XL←Xi
214
Yi<YL
N
Y
216
YL←Yi
XL←Xi
222
Yi<YR
N
Y
224
XR←Xi
YR←Yi
218
Yi<YR
N
Y
220
YR←Yi
XR←Xi
226
全車終了?
Y
N
228
i ← i + 1
230
ゲイン設定
(XR、YR)→DEGR
(XL、YL)→DEGL
232
アクチュエータ制御
END

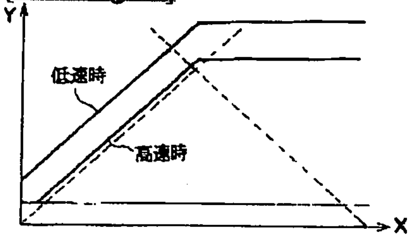
[Drawing 6]


他車両認識ルーチン
白線検出ウインド設定
400
エッジ検出
402
直線近似（ハフ変換）
404
カーブ路、度合演算
405
406
A₂≧A≧A₁?
N
Y
408
自車速V 読取
410
ウインド補正幅 読取
先行車両認識 領域設定
412
414
A＞A₂
N
Y
416
自車速V 読取
補正値 読取
418
補正ゲイン 読取
420
ウインド補正幅演算
422
先行車両認識領域設定
424
426
自車速V 読取
428
補正値 読取
430
補正ゲイン 読取
432
ウインド補正幅演算
434
車両認識領域設定
他車両認識（水平エッジ点積分）
436
車両位置座標演算
438
RETURN

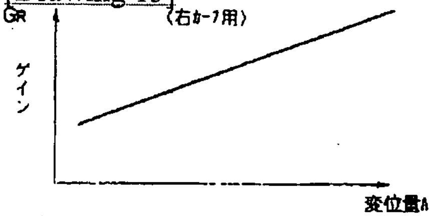
[Drawing 10]


Y
Wp
Wp
αL
αR
X

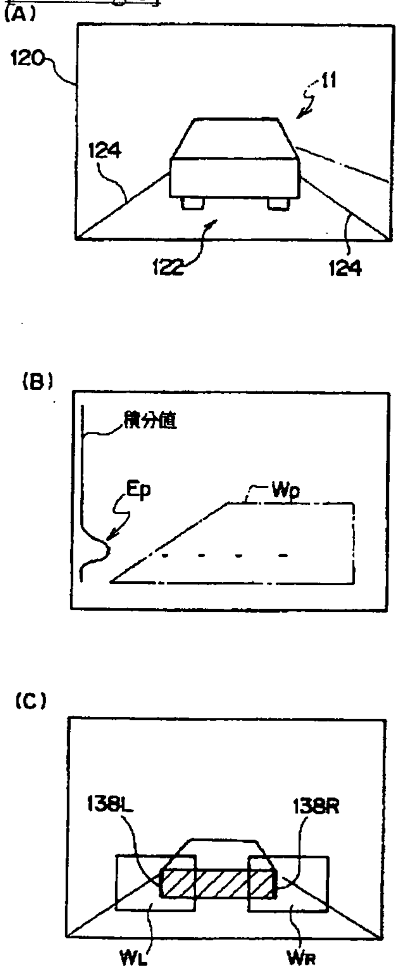
[Drawing 11]



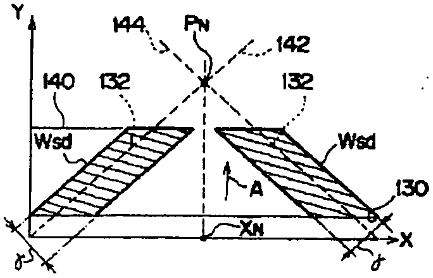
[Drawing 13]



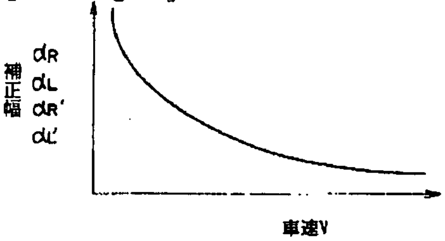
[Drawing 8]


(A)
120
11
124
122
124
(B)
積分値
Ep
Wp
(C)
138L
138R
WL
WR

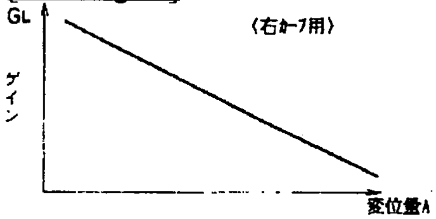
[Drawing 9]


Y
144
P_N
142
140
132
132
Wsd
Wsd
A
130
X_N
X
δ
δ

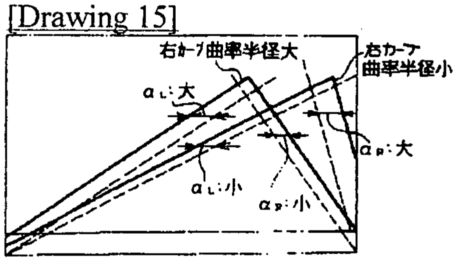
[Drawing 12]



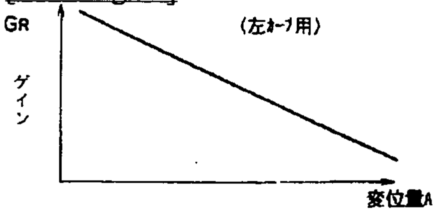
[Drawing 14]



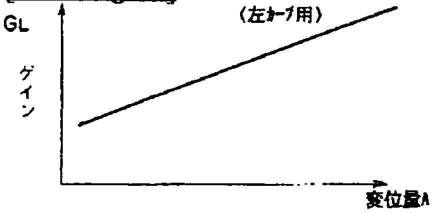
[Drawing 15]


右カーブ曲率半径大
右カーブ
曲率半径小
α_L:大
α_L:小
α_R:小
α_R:大

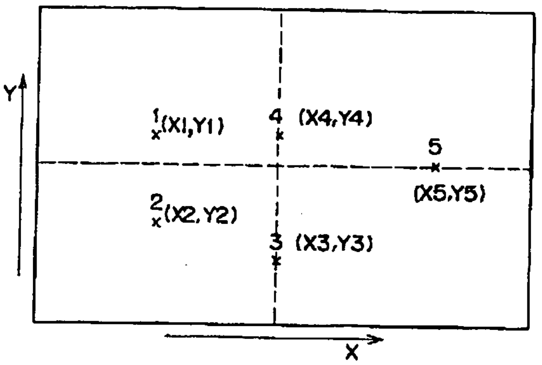
[Drawing 16]



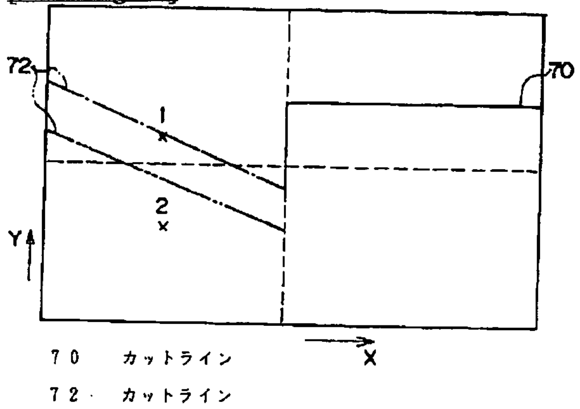
[Drawing 17]



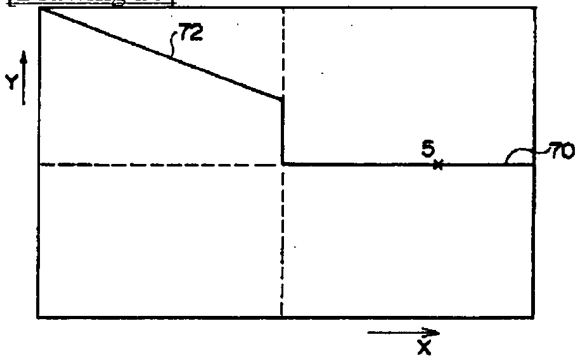
[Drawing 18]


Y
1 (X1,Y1)
4 (X4,Y4)
5
(X5,Y5)
2 (X2,Y2)
3 (X3,Y3)
X

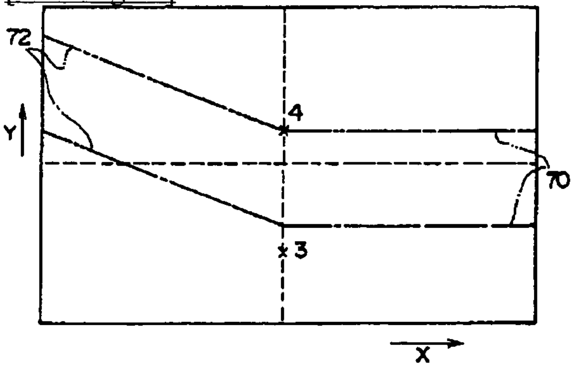
[Drawing 19]


72
70
1
2
Y
X
７０ カットライン
７２ カットライン

[Drawing 20]



[Drawing 21]



[Translation done.]